FSB Requirements Development and Management Process

Purpose

To support Flight Software (FSW) requirements development and management.

Requirements development uses an iterative approach to support requirement evolution. New requirements may be analyzed while approved requirements are being implemented.

Requirements management involves: 1) establishing a controlled environment for storing the requirements; 2) establishing and maintaining requirements traceability to parent requirements, to design specifications, and to test specifications, and 3) controlling and coordinating changes to requirements.

Scope

This process applies to all FSW requirements developed in the FSB.

Entry

- FSW System-level requirements approved by Project.

Exit

- FSW delivered to project.

Inputs

- Project-approved FSW System-level requirements.
- Project-level documents such as Mission requirement documents, interface control documents, algorithm documents.
- Requirements Change DCRs.

Outputs

- Requirements database.
- One or more Requirements Traceability Matrices.
- Requirements-to-Design Traceability Matrix.
- Requirements-to-Test Traceability Matrix.
- Traceability reports.

Roles

FSW Requirements Systems Engineer, FSW Development Team Lead, or designee:

- Analyzes requirements.
- Enters requirements into Requirements Management tool.
- Creates and maintains Requirements Traceability Matrices.
- Creates and maintains Requirements-to-Design Traceability Matrix.
- Generates traceability reports.
- Analyzes traceability issues.

FSW Test Team Lead, or designee:

- Creates and maintains Requirements-to-Test Traceability Matrix.
- Generates test-related traceability reports.
- Analyzes test-related traceability issues.

Tools

- Requirements Management tool
- MKS Integrity 2005 or later.
- Excel or MS Access for small projects.

Tasks

- Develop Requirements.
- Create a Requirements Database.
- Manage Requirements Traceability.
- Manage Requirements-to-Design Traceability.
- Manage Requirements-to-Test Traceability.
- Manage Changes to Requirements.

Task: Develop Requirements

Purpose: Develop, review, and approve requirements iteratively.

- Analyze high level requirements and define detailed requirements, iteratively.
- Refer to ISD Requirements Development Process.
- Use FSB Requirements Document Template.
- Prioritize requirements based on successive development builds.
- Conduct Software Requirements Review (SRR) when requirements are stable.
- Use FSW Requirements Review Standard.
- Conduct Peer Reviews, as needed, to review and approve requirements.
- Use FSB Requirements Inspection Standard.
- Store the approved requirements in a database (see below).
- Changes to approved requirements are controlled (see below).

Task: Create a Requirements Database

Purpose: Establish a controlled environment where requirements can be managed.

- Use an automated requirements management (RM) tool to support requirements traceability.
- **MKS Integrity** is the FSB standard for the RM tool.
- For small projects tools such as **Excel** or **MS Access** may be used.
- Enter **system-level flight software (FSW) requirements** (typically **Level 3**, but project dependent) into the RM database. These should include all derived FSW requirements from other requirement documents such as the MRD, ICD, etc., as needed so that the subsystem-level FSW requirements can be traced solely to these requirements.
- Include requirements from other documents such as MRD, ICD, GN&C, etc., directly only if unavoidable.
- Include requirement numbers, requirement text, and source identifiers as a minimum set of attributes to uniquely define each FSW requirement.
- Include supporting material for each requirement necessary to completely understand and assess the FSW requirement's meaning and context.
- Enter **subsystem-level FSW requirements** (typically FSW **Level 4**, but project dependent) into the requirements management database as a separate group of requirements.
- Include requirement numbers, requirement text, and source identifiers as a minimum set of attributes to uniquely define each requirement.
- Include supporting material for each requirement necessary to completely understand and assess the requirement's meaning and context.

Task: Manage Requirements Traceability

Purpose: Establish and maintain logical connections between requirements groups that define comparable information at different levels of detail.

- Create a ***Requirements Traceability Matrix (RTM)*** that traces subsystem-level FSW requirements into system-level FSW requirements.
- Refer to ISD Requirements Traceability Matrix Guidelines (580-GL-027-01).
- If system-level FSW requirements are in multiple documents (MRD, ICD, etc.) then the RTM would be multi-dimensional (or several RTMs may be needed).
- Ensure each system-level FSW requirement is mapped to at least one subsystem-level FSW requirement (i.e., no system-level requirement "*widows*").
- Ensure each subsystem-level FSW requirement is mapped to at least one system-level FSW requirement (i.e., no subsystem-level requirement "*orphans*").
- Report on and resolve system-level requirement *widows* and subsystem-level requirement *orphans*.
- Whenever requirements are altered, created, or deleted, perform a corresponding traceability analysis.

Task: Manage Requirements-to-Design Traceability

Purpose: Establish and maintain design specification to each requirement.

- Assign FSW subsystem-level requirements to design specifications and create a ***Requirements-to-Design Traceability Matrix***.
- Include subsystem name. The subsystem design in the Design Reviews (PDR,CDR) is the design specification.
- Update traceability periodically to reflect design changes.

Task: Manage Requirements-to-Test Traceability

Purpose: Establish and maintain test specification to each requirement.

- Assign subsystem-level FSW requirements to tests and create a ***Requirements-to-Test Traceability Matrix***.
- For tests include information such as test procedure name, test pass/fail status, tested date(s).
- Ensure each requirement is mapped to at least one test.
- Update traceability periodically to reflect test-related changes.

Task: Manage Changes to Requirements

Purpose: Manage and control changes to requirements.

- Approve Discrepancy or Change Requests (DCRs) for changes to approved requirements or adding new requirements, by Configuration Control Board (CCB) / Internal review Board (IRB) (see *FSW Configuration Management Plan*).
- Perform the tasks described in *ISD Requirements Management Process (580-PR-024-001)* to manage and control changes to the requirements:
- Analyze Change Request for impact and feasibility
- Prepare an impact statement
- Obtain approval of the change requested
- Generate changed Requirements, Specification, and change requests for other controlled products as necessary
- Verify changed Requirements and Specifications
- Validate changed Requirements and Specifications
- Update and distribute updated documentation as necessary
- Coordinate incorporation of approved changes to ensure synchronization with the integration and test cycles so as to minimize the impact of the changes to the test environment.

Ownership and Approval Authority

The FSW Systems Branch Head is the owner of this policy. The FSB Standards CCB has approval authority.

Change History

Version	Date	Change
0.3	12/05/08	DCR #336 - Required Document Footer. Also updated formatting for consistency.
0.2	11/22/06	Second draft.
0.1	06/03/05	Initial draft.